I have taken advantage of the late meeting of the British Association, at Exeter, to bring the subject before meteorologists. It appears that the general term meteorology embraces two entirely distinct subjects, one of these having reference to physiology, while the other forms a branch of physical research.

The object of the one is to study the connexion between atmospheric conditions, and the health of such organisms (animal and vegetable) as are subjected to these conditions; while the other or physical question is particularly concerned with the movements of the earth's atmosphere, and with the causes thereof.

On both of these important branches we are in almost entire ignorance. With respect to the first, the amount of vapour present in the air is without doubt a very important element of climate, inasmuch as this affects in a marked manner the skin of the human body, and the leaves of plants; but I am not aware that it has yet been determined by the joint action of naturalists and meteorologists what is the precise physical function expressing proportionally the effect of moisture upon animal and vegetable life. Is it simply relative humidity? or does not a given relative humidity at a high temperature have a different effect from that which it has when the temperature is low? There is, in fact, an absence of information as to the precise physical formula which is wished by physiologists, as expressing the effect of moisture upon organic life.

If we come in the next place to consider the physical branch of meteorology, or that which regards the motions of the earth's atmosphere, this is almost as far behind. The explanation of the trades and anti-trades is the one great generalisation which we have accomplished. Certain laws regarding cyclonic storms have lately been discovered; but to this day we are in ignorance of that exact motion of air which constitutes a cyclone, some holding that the motion is entirely rotatory, while others maintain that there is a considerable indraught of air from the circumference to the centre. Again, there is no fact better established than the diurnal movements of the barometer; but what is the motion of air or its constituents implied by them is still a point open to dispute. Now, these are both matters of fact, and there must be some reason why we know so little about them. Nothing, of course, could be known until the instrumental difficulties of the problem had been surmounted, and a suitable anemometer constructed; but now, we have good instruments, and have begun to make good observations. What, then, is the remaining drawback? I believe it is to be found in the fact that while instrumental appliances and observations have progressed, methods of reduction, which naturally lag behind observations, have not yet progressed, but are only just beginning to move. Those hitherto in use combine the physiological with the physical element,—they are a cross between the two, and are subject, I venture to say, as all such crosses are, to the general law of barrenness. Still not much time has been lost, for in the dark ages of few and bad observations it would have been useless to divide the meteorological field: meteorology, then, might be likened to one of those organisms of very low development that had just begun to exhibit the slightest possible tendency to split into two; the application of the knife would then have been premature; but now it may be used with advantage, and the one half allowed to rush into the arms of physiology, while the other seeks the embrace of physical research. In plain language, if we want to obtain physiological results we must reduce our observations with especial reference to physiology, while if physical results be desired, they must be reduced with especial reference to physical laws.

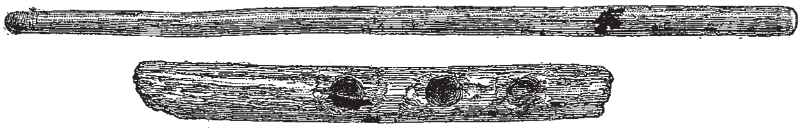
I must, however, reserve for another article a description of a method of reduction having this latter object in view. BALFOUR STEWART

PREHISTORIC TIMES

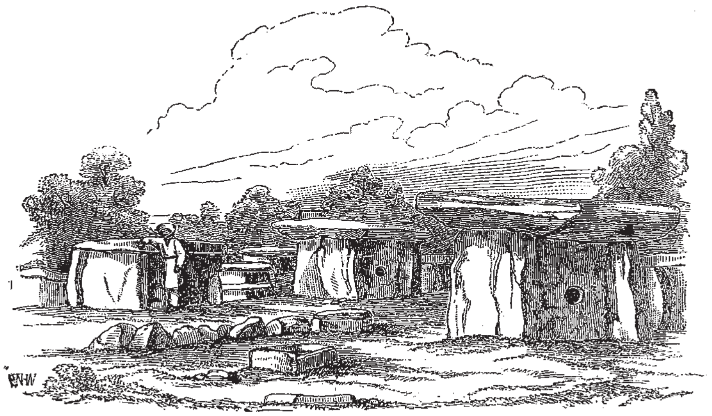
Prehistoric Times, as illustrated by Ancient Remains, and the Manners and Customs of Modern Savages. By Sir John Lubbock, Bart., F.R.S., &c. Second Edition. (London, 1869: Williams and Norgate.)

WE may be pardoned for not being cosmopolite enough to judge books without any regard to their nationality. Too often, though Englishman may have contributed much to some important subject, no systematic English treatise sums up the evidence, so that our students have to depend too much on foreign books of reference. On the present subject of prehistoric archæology, however, it is satisfactory that we have, in Sir John Lubbock's work, not only a good book of reference, but the best. Its well-known plan and argument need not be re-stated here, but it has to be pointed out that the present edition contains much important new matter, especially in the chapters relating to the Stone Age, Megalithic monuments, Cave-men, and the condition of modern savages.

It is a marked character of the recent researches in prehistoric archæology, and it is one of the reasons which justify the reception of the subject as a department of positive science, that the facts disclosed lend themselves to generalisations of a thoroughly scientific character; and that, moreover, when the generalisations are once made, new facts drop in and find their places ready. Various subjects discussed in the present work illustrate this: take, for instance, the stone-implement question. The finding of flakes, scrapers, spear-heads, &c. in different parts of the world, justified a general surmise that the Stone Age had once prevailed in all inhabited districts. A few years ago, however, there were regions whence stone implements seemed hardly forthcoming. India appeared to have none, but when properly looked for they proved abundant, as witness Mr. Bruce Foote's paper in the Transactions of the Norwich Congress of 1868. Africa also seemed almost outside the Stone Age world; but now the finding of stone implements in South Africa, and even legends of their use, give the primal Stone Age possessions there as elsewhere. No sooner, too, were the rude implements of the Drift type thoroughly recognised in the valley of the Somme, than it came into notice that such had long before been collected in England without knowledge of their special importance; and now Spain and India, and other districts, furnish specimens which come under the same class. So it was with the art of fire-making by friction of pieces of wood. Over most of the world, savage or civilised, the traces of its early prevalence were sufficient to justify its being generalised on as one of man's primitive arts. But there were some exceptional cases, as in Tasmania, where the natives were said to have had no means of producing fire before their acquaintance with Europeans, but to have only carried lighted brands from place to place. Sir John Lubbock, however, is now able to give (p. 440) a drawing of a Tasmanian fire-drill. It is just like the well-known instrument of Australia, Africa, and America.

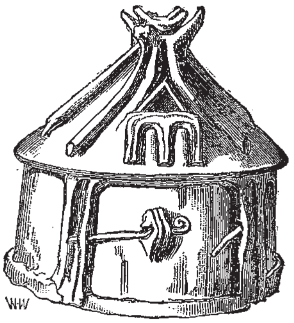

TASMANIAN FIRE DRILL.

So again, in a less degree, with those rude stone menhirs, cromlechs, kistvaens, &c., which are classed under the head of Megalithic monuments. The range over which these interesting structures are found has been continually extending to new districts. Dr. Hooker's account, in his Himalayan Journals, of the modern setting up of Megalithic structures by indigenous tribes in India, received for years little notice, but has now become one of the leading facts of prehistoric archæology. As may especially be seen in Meadows Taylor's recent paper in the Journal of the Ethnological Society, monuments like our own Kit's Coty House, or Dance Main, are known in vast numbers in India, and are made the subject of careful study. A group from the reduced plate in Sir John Lubbock's work (p. 120) is given here.

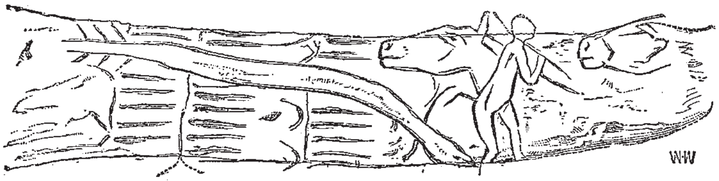

MEGALITHIC STRUCTURES IN INDIA.

Was the civilisation of the lower races spread from a single centre, or from many? Is the correspondence of savage culture the result of common inheritance, or independent similar invention? This still most obscure problem is intimately connected with the evidence brought forward in Sir John Lubbock's generalisations, and especially with his details of modern savage tribes as representatives of older strata of prehistoric man. The point is one which especially strikes those who notice the surprising similarity of the implements of the lower races in the most different regions, as where, in the present work, three all but identical arrow-heads from modern North and South America and ancient France, are set side by side (p. 99); or modern savage flint scrapers are figured, undistinguishable from those of remote European antiquity. Sir John Lubbock insists with much force (p. 545) on the consideration that this similarity is due especially to similarity of materials; that the pointed bones used for awls are necessarily similar everywhere, that obsidian knives from Mexico are like the flint knives of our own country, not so much because the ancient Briton resembled the Aztec, as because the fracture of flint is like that of obsidian. And his remark (p. 121), that any child with a box of bricks will build dolmens and triliths is a highly reasonable protest against those antiquaries who interpret the similarity of Megalithic structures in different districts as proof that their builders were of kindred race.

With regard to a most interesting topic treated of by Sir John Lubbock, that of the existence of savage tribes destitute of religion, I am disposed to entertain a view different from his. To a great extent, indeed, our difference is rather nominal than real. He adopts a definition of religion more stringent than I do, and thus excludes from the catalogue of religious tribes many which on the same evidence I should include. Dieffenbach's evidence, for instance, is quoted as follows (p. 556): "If we take religion in its common meaning, as a definable system of certain dogmas and prescriptions, the New Zealanders have no religion. Their belief in the supernatural is confined to the action and influence of spirits on the destiny of men, mixed up with fables and traditions." This, from my point of view, is an admission that the New Zealanders have a religion; and, indeed, we know that they are strong believers in a future existence, and regard the names of their ancestors as tutelary spirits. Moreover, the assertions of travellers on this point not seldom break down on closer scrutiny. Thus mention is made here of a statement in the *Voyage de l'Astrolabe* that the Samoans have no religion; but the explorers' information was evidently insufficient, and an elaborate account of the Samoan deities, priests, temples, prayers, sacrifices, may be found in Turner's "Polynesia." Among Sir John Lubbock's list of evidence there are, indeed, cases which cannot be thus easily met. But while admitting theoretically that a state without religion may have prevailed among early tribes of men, and may still be represented by surviving savages, I fail to find as yet any indisputable case.


TERRA-COTTA URN FROM ALBANO

Among the special points of interest introduced in the present volume, it may be mentioned that the habitations men lived in during the Bronze Age are displayed in a very interesting way, in imitative terra-cotta urns of the period, such as this from Albano. We must probably go many ages back from the date of the Italians of the Bronze Age, who dwelt in these neat huts, to the date of the rude Stone Age cave-men of Central France, the contemporaries of the reindeer and the mammoth, which they delineated with such remarkable artistic vigour. One of these people's interesting drawings (p. 324) is given here, representing a snake or eel, two horses' heads, and a human figure (which Lord Monboddo would probably have claimed as special evidence). This may possibly be the earliest known portrait of man.


STONE-AGE SCULPTURES

The advocates of the theory that savages are degenerate descendants of civilised men, have still full scope in pointing out the imperfections of their adversaries' evidence and argument. But the new facts, as they come in month by month, tell steadily in one direction. The more widely and deeply the study of ethnography and prehistoric archæology is carried on, the stronger does the evidence become that the condition of mankind in the remote antiquity of the race is not unfairly represented by modern savage tribes.

E. B. TYLOR.

THE ORIGIN OF SPECIES CONTROVERSY.

Habit and Intelligence, in their Connection with the Laws of Matter and Force. A Series of Scientific Essays. By Joseph John Murphy. (Macmillan and Co., 1869.)

I.

The flood of light that has been thrown on the obscurest and most recondite of the forces and forms of Nature by the researches of the last few years, has led many acute and speculative intellects to believe that the time has arrived when the hitherto insoluble problems of the origin of life and of mind may receive a possible and intelligible, if not a demonstrable, solution. The grand doctrine of the conservation of energy, the all-embracing theory of evolution, a more accurate conception of the relation of matter to force, the vast powers of spectrum analysis on one side, showing us as it does the minute anatomy of the universe, and the increased efficiency of the modern microscope on the other, which enables us to determine with confidence the structure, or absence of structure, in the minutest and lowest forms of life, furnish us with a converging battery of scientific weapons which we may well think no mystery of Nature can long withstand. Our literature accordingly teems with essays of more or less pretension on the development of living forms, the nature and origin of life, the unity of all force, physical and mental, and analogous subjects.

The work of which I now propose to give some account is a favourable specimen of the class of essays alluded to, for although it does not seem to be in any degree founded on original research, its author has studied with great care, and has, in most cases, thoroughly understood, the best writers on the various subjects he treats of, and has brought to the task a considerable amount of original thought and ingenious criticism. He thus effectually raises the character of his book above that of a mere compilation, which, in less able hands, it might have assumed.

The introductory chapter treats of the characteristics of modern scientific thought, and endeavours to show, "that the chief and most distinctive intellectual characteristic of this age consists in the prominence given to historical and genetic methods of research, which have made history scientific, and science historical: whence has arisen the conviction that we cannot really understand anything unless we know its origin; and whence also we have learned a more appreciative style of criticism, a deeper distrust, dislike, and dread, of revolutionary methods, and a more intelligent and profound love of both mental and political freedom." The first six chapters are devoted to a careful sketch of the great motive powers of the universe, of the laws of motion, and of the conservation of energy. The author here suggests the introduction of a useful word, *radiance*, to express the light, radiant heat, and actinism of the sun, which are evidently modifications of the same form of energy,—and a more precise definition of the words *force* and *strength*, the former for forces which are capable of producing motion, the latter for mere resistances like cohesion.

He enumerates the primary forces of Nature as, gravity, capillary attraction, and chemical affinity, and notices as an important generalisation "that *all primary forces are attractive*; there is no such thing in Nature as a primary repulsive force" (p. 43). Now here there seem to be two errors. Cohesion, which is entirely unnoticed, is surely as much a primary force as capillary attraction, and, in fact, is probably the more general force, of which the other is only a particular case; and elasticity is the effect of a primary repulsive force. In fact, at p. 26, we find the author arguing that *all matter is perfectly elastic*, for, when two balls strike together, the lost energy due to imperfect elasticity of the mass is transferred to the molecules, and becomes heat. But this surely implies repulsion of the molecules; and Mr. Bayma has shown, in his "Molecular Mechanics," that repulsion is as necessary a property of matter as attraction.

The eighth chapter discusses the phenomena of crystallisation; and the next two, the chemistry and dynamics of life. The reality of a "vital principle" is maintained as "the unknown and undiscoverable something which the properties of mere matter will not account for, and which constitutes the differentia of living beings." Besides the formation of organic compounds, we have the functions of organisation, instinct, feeling, and thought, which could not conceivably be resultants from the ordinary properties of matter. At the same time it is admitted that conceivableness is not a test of truth, and that all questions concerning the origin of life are questions of fact, and must be solved, not by reasoning, but by observation and experiment: but it is maintained that the